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STUDY PROJECT

THE ROLE OF THE FIELD ARTILLERY BRIGADE IN COUNTERFIRE

BY

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JUN 20 1990

LIEUTENANT COLONEL NEIL E. NELSON

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In the past, restructuring had not been developed from a total-force perspective. The infantry division had evolved along a path separate from that of the field artillery. Only occasionally had they been able to coordinate their individual doctrinal and tactical needs. The cost of new, advanced weapon systems have proven too expensive to countenance restructuring along separate, often catch-up, developmental paths.

Old concerns of the infantry regarding the reliability of the artillery to engage in the fight and earlier artillery concentration on indirect fire gunnery computations have been overcome by technological and doctrinal advances. The requirements for highly mobile, survivable, and lethal weapons coordinated through automated command, control and communications networks on an extremely volatile non linear battlefield demanded a broader and coordinated approach.

For the field artillery this meant discarding traditional means of dividing up the indirect fire requirements of the battlefield and of traditional division artillery and corps artillery mission orientations. The field artillery brigade and its role in counterfire is pivotal in developing a total force orientation in the application of indirect fire support doctrine.

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THE ROLE OF THE FIELD ARTILLERY BRIGADE IN COUNTERFIRE

AN INDIVIDUAL STUDY PROJECT

by

Lieutenant Colonel Neil E. Nelson

Colonel Duane E. Williams

Project Advisor

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U.S. Army War College
Carlisle Barracks, Pennsylvania 17013

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ABSTRACT

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This realization revealed the unsatisfactory nature of adaptive tinkering as a restructuring philosophy. Restructuring should be systematically based upon two fundamental elements of battlefield effectiveness: weapon systems and tactics.

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THE ROLE OF THE FIELD ARTILLERY BRIGADE IN COUNTERFIRE

CHAPTER I

INTRODUCTION

The modern doctrinal term counterfire is derived from an older term, counterbattery. This older term dealt primarily with the location and destruction of enemy mortar and artillery systems. The idea of destroying the enemy's artillery is older than the cannon.

For centuries, soldiers have pitted their genius against the evolution of technology and doctrine: given a particular technology, what doctrine can defeat it. Then given the doctrinal use of the technology, what new technology can overcome it? I will address the evolution of counterbattery into counterfire and the role of the field artillery brigade in counterfire from this perspective: In light of doctrinal and technological advances evinced in the evolution of the infantry division and those evinced in the evolution of artillery support, what should the role of the field artillery brigade be in general and particularly with regard to counterfire? It is time to realize that both the division artillery and the field artillery brigade are required artillery organizations on future battlefields, especially non-linear battlefields like Vietnam, Sinai and likely future war zones.

The Civil War signaled the end of a military era dominated by the cannon. Then during World War I, the field artillery returned to a place of dominance. Concurrently, the need to attack

the enemy's artillery increased. New tactics, techniques, and equipment in target acquisition, survey, cannonry and gunnery were developed to enhance the artillery's counterbattery capability. Counterbattery doctrine in World War I was effective. But World War I featured static warfare, whereas post-war maneuver technology and doctrine came to focus on mobile warfare. Little was done between the wars to correct the inadequacies of counterbattery doctrine based on the immobility of artillery. That is, counterbattery doctrine did not take cognizance of post-war developments. (1)

However, as World War II casualties to artillery fire increased, so also did an interest in counterbattery doctrine increase. Sound and flash ranging provided the primary means for detecting enemy artillery. The integration of rapid detection and attack was achieved through the formation of Observation Battalions. Then, the years between World War II and the Korean War witnessed another decline of interest in counterbattery. The Korean War brought a resurgence of interest. In each of the World Wars and the Korean War, developments in artillery technology and doctrine were able to respond quickly enough to meet the demands of the battlefield. (2)

But the Vietnam War proved to be different. Despite tremendous firepower, despite numerous target acquisition systems and despite the use of Target Acquisition Battery, target production centers counterbattery fires were unsuccessful to say the least. (3) Following Vietnam, the Field Artillery School introduced a

major change in field artillery doctrine; it broadened the counterbattery role to include attack on the enemy's entire fire support systems. Counterbattery then became known as counterfire. Since that time counterfire (including its precise definition) has undergone considerable study. (4)

The inability of artillery to execute this evolving doctrine has been exacerbated by major advances in maneuver force mobility, dramatic increases in corps and division frontages, and slower advances in command and control communications and equally slow advances in the fire support system's ability to locate targets, mass fires and range deep. Nonetheless, in the mid-seventies the division artillery was given control of counterfire. Consequently, the maneuver community believes that direct support artillery will be so busy fighting an artillery duel that they won't be able to provide adequate support to maneuver elements. (5)

Thus division artillery has fallen into a dilemma. They have been allotted no increase in the number of available artillery tubes, no increase in range, no increase in ammunition supply capability. Further, the new countermortar and counterbattery radars increase the density of targets for counterfire. Thus there has not been sufficient artillery available at division artillery to execute both close support and counterfire responsibilities. However, the deployment of the Multiple Launch Rocket System (MLRS), offered increased response and lethality, but it presented enormous command and control and logistic burdens. The

liabilities added up faster than the assets. All a corps artillery could do when called upon to assist was send more cannon or MLRS units. The corps artillery has no target acquisition assets, no increased target production capability, and little in the way of logistics support. In short, the corps artillery assets add to firepower, but they also add to the burdens of coordinating the counterfire fight.

Equipment that focused on increased lethality, range, ammunition support, and target acquisition always seemed to be just around the corner. So a technological fix, promised by the combat developers, became the proverbial check-in-the-mail. Doctrine did not resolve the dilemma. In fact, the artillery community became a house divided. Parochialism between division artillery and corps artillery solutions further exacerbated the concerns of the maneuver forces. Emphasis then returned to maneuver solutions: increased mobility, firepower and the use of air support.

But the dilemma can and must be resolved! It is time to set aside parochial thoughts of division versus corps artillery, light versus medium, cannons versus rockets and missiles. It is time to look at what the stated fire support functions are and then to determine how they will change traditional organizational roles. Which functions have been advanced or automated? Which functions remain doctrinal, equipment and training deficiencies? Which deficiencies should be resolved first? And which deficiencies can not be resolved in the near future?

The corps artillery's field artillery brigades are key. In

the short term, these brigades, properly equipped and organized, can rapidly reinforce any maneuver force, with or without a direct support artillery element. They can increase; target acquisition and target production, firepower, command and control and logistical augmentation. In the longer term when the advanced technology cannon, rocket, acquisition and information systems arrive, these brigades offer the optimum vehicle for maximizing capability during the fielding transition should a combat contingency require deployment. As for counterfire, the division artillery whose division has been designated the main effort must be reinforced. Again a properly organized and equipped field artillery brigade can rapidly plug-in to the divarty, receive the divarty commander's guidance, augment any portion of the divarty mission from direct support to command and control of counterfire for the divarty. Then the divarty is free to put maximum effort into direct support without neglecting counterfire.

ENDNOTES

1. J.B.A. Bailey, Field Artillery and Firepower, p. 51.
2. Donald M. Rhea, "Target Acquisition Today... Tomorrow," Field Artillery Journal, May-June 1975, p. 7.
3. David E. Ott and Donald M. Rhea, "Counterfire," Army, July 1976, p. 24.
4. Ibid., p. 22.
5. Ibid., p. 24.

CHAPTER II

COUNTERFIRE BY DEFINITION

JCS Pub 1, Dictionary of Military and Associated Terms, defines counterfire as "Fire intended to destroy or neutralize enemy weapons." (1) Army Field Manual (FM) 100-5, Operations, states that "Among the activities typically comprising close operations are... Indirect fire support (including counterfire)." It then further defines fire support: "Fire support includes mortars, field artillery, naval gunfire, army aviation, and air-delivered weapons." (2) FM 6-20, Fire Support in the Airland Battle, defines counterfires in this way:

Counterfires are used to attack enemy indirect-fire systems, to include mortar, artillery, air defense, missile and rocket systems. Observation posts and field artillery command and control facilities are also counterfire targets. Counterfire allows freedom of action to supported maneuver forces and is provided by mortars, cannons, guns, and aircraft. Within the field artillery, counterfire is normally the primary responsibility of the general support (GS) and the general support reinforcing (GSR) units. However, it may be fired by any unit. (3)

FM 6-20-30, Fire Support for Corps and Divisions, states that

Counter fire consists of fires targeted throughout the battlefield that are intended to attack the total enemy fire support system. It includes fires against accompanying mortars; helicopter forward operating bases; vector target designation points (VTDPs); fire support command and control; artillery, rocket, and missile systems; and support and sustainment installations.

It further observes that

Counterfires gain freedom of action for all friendly maneuver forces and is provided by all of the fire support means, both lethal and nonlethal. Counterfire

is not a separate battle. It is inseparably tied to close and deep operations and is part of the overall combined arms fight to achieve fire superiority. A fine line may exist between counterfire and attack at depth. However, once a target is capable (that is, within range) of affecting the close fight, its attack is considered counterfire. (4)

Therefore, counterfire is not a separate battle. It is an extremely important part of close operations, but it should not be confused with the maneuver desire for close supporting fires, fires that support troops in contact at danger close to the limit of visual observation ranges. For the sake of clarity, I shall refer to these close supporting fires as direct support, for they are habitually under the control of direct support artillery. Counterfire is provided by all of the fire support means. It includes attack of enemy air defense systems, helicopter forward support bases and command and control facilities, among other non-artillery specific targets. Counterfire is provided by mortars and aircraft as well as artillery systems, naval gunfire, air defense artillery (in their secondary mission) and other means in both lethal and nonlethal formats. Within the field artillery it has normally been the primary responsibility of general support (GS) and general support reinforcing (GSR) units.

Counterfires are not limited to the assets available to or made available to the division, nor restricted to those of the corps artillery. In fact, the intent clearly is to provide maneuver with maximum freedom of action by denying the enemy effective use of his fire support system through the coordinated employment of all available friendly fire support means.

To understand counterfire's value more clearly, the definition of counterfire must include what the enemy's fire support system intends to do. The Soviet doctrine during World War II and since has been to exploit the success of its fire support with maneuver. Threat artillery theoretically provides the decisive factor in achieving battlefield success and guaranteeing victory. Its ability to mass fires for the main attack will be devastating. To this end Soviet forces employ artillery and air forces well forward and in large numbers. Estimates indicate the Soviet forces will use large tonnages of artillery ammunition in extended preparations and rolling barrages to achieve success. To do so division artillery groups (DAG) are pushed forward to support the regimental artillery groups (RAG). The primary target of these groupings of threat artillery are friendly maneuver forces and battle positions, not friendly artillery! The regimental artillery group (RAG) focuses almost entirely on friendly maneuver forces, while approximately 80% of the division artillery group (DAG) is focused on friendly maneuver forces. The army artillery group (AAG) focuses on our friendly fire support. The bulk of all these artillery formations are within 8-10km of the forward line of troops (FLOT). (5)

As friendly fire support systems enter the counterfire fight, they, in essence, are attacking the Army Group tactical center of gravity. Counterfire success, in support of close operations and complementary to all direct support fires, will neutralize threat ability to execute his doctrinal plan of exploit-

ing firepower with maneuver. Active control of counterfire is essential. Determination of who fights the counterfire fight is, or should be, a matter of proximity to the fight and capability to execute. Counterfire should not be restricted to traditional organizational missions.

The traditional field artillery missions of direct support, reinforcing, general support reinforcing and general support establish inherent responsibilities for the artillery commander assigned each mission. But traditional missions do not preclude any or all weapons from responding to fire support requirements of the supported maneuver commander. The requirements of fire support to conduct counterfire do not alter the inherent responsibilities of each mission. Neither does an assigned mission prevent the force artillery headquarters from calling on all available artillery to weight the battle. Hence, there is no doctrinal conflict when the division artillery commander decides to control counterfire nor when he decides to let a supporting artillery headquarters control counterfire. Similarly, there is no doctrinal conflict when reinforcing artillery or even direct support artillery responds to calls for counterfire fires.

ENDNOTES

1. U.S. Department of Defense, Joint Chiefs of Staff Publication 1, p. 93.
2. U.S. Department of the Army, Army Field Manual 100-5, p. 19 and 43.
3. U.S. Department of the Army, Army Field Manual 6-20, p. 2-8.

4. U.S. Department of the Army, Army Field Manual 6-20-30,
p. B-14.

5. Ibid., pp. B-14. to B-15.

CHAPTER III

EVOLUTION OF THE INFANTRY DIVISION

The evolution of the division in the American army began with the Revolutionary War. The doctrine and innovative use of technology espoused in the Napoleonic era affected the organizational flavor of the early American division. Certainly the technologies that came out of the Industrial Revolution had their influence as well. Though some changes occurred as the result of increases in mobility, such as the use of railroads and steam transportation, changes by in large took place in response to increases in lethality of weapons. Likewise, increased lethality most often led to changes in tactics. The Civil War signaled the decline of the Napoleonic style of using artillery forward of infantry. The change was brought about by the advent of rifling which gave enemy infantry the ability to range artillery gun positions with accurate musket fire. Further, smokeless powder eliminated artillery concealment previously provided by the firing of cannons with powder that smoked. Army infantry and cavalry resented the movement of artillery to the rear. Nonetheless, such changes in tactics were clearly a response to weapons technology; they were not an attempt to standardize tactics or organize a standard division. The first standard American division, the Square Division, was not established until just prior to the First World War.

The square division was organized in five echelons: divi-

sion, brigade, regiment, battalion and company. WWI weapons advanced faster than tactics. Divisions for the most part simply got larger to absorb the losses caused by the advance in weaponry. The lethality of the machine gun, breach loading artillery and rapid firing rifles led to

stabilized trench warfare [which] extended field fortifications in depth across the entire army front...Brigades abreast, regiments abreast with battalions in depth. Small assault groups maneuvered independently within assigned zones of advance. Artillery [was] employed in mass in systematic bombardment aimed at destruction of enemy forces. Infantry fires in the defence [were] sufficient to halt or contain most attacks (frontal). Infiltration... regains the power of the offensive making penetrations possible and the preferred form of maneuver. (1)

Following World War I the division underwent dramatic changes in organization in an attempt to bring doctrine in line with continued advances in weapons developments, the emergence of airpower and the desires of General Lesley McNair, Commander of Army Ground Forces, to make the Army lean and simple. (2)

By 1939 the U.S. Army had an approved standard division for the future; the "triangular" division: "...the object sought was an infantry division that was smaller and faster than the old but with as much firepower." (3) (4) (5)

The attack on France in 1940 provided reason to reconsider the structure of the division. Throughout World War II the division underwent continual change, generally in response to the conditions of war and the rapid development of weaponry. Without doubt, the infantry needed the shock and mobility of the armor. This need led to grouping certain equipment at headquarters

higher than previously assigned. This grouping was called 'pooling':

...the doctrine of 'pooling' as applied to units and equipment. The success of this doctrine made it applicable, years later, to the standard infantry division.

In 1943, however, the armored division was remodeled to comprise an equal number of infantry and tank battalions, three of each, plus the three artillery battalions.

Regiments now disappeared from the armored division, in pursuit of McNair's goal of flexibility. With no fixed regimental formations present in the division anyway, additional battalions of tanks, infantry, or artillery could readily be added or detached in any combination as any situation required. (6)

Pooling also had its adversaries. Senior commanders, some of whom were perhaps not above parochialism, wanted to keep their tanks, tank destroyers and air defense artillery organic to the division. But conditions were not unlike today. Then, as now, mobility, range and the enemy's ability to mass at strategic points on the battlefield can place friendly forces at a significant force ratio disadvantage. Such conditions require a certain flexibility for a tailored response -- a flexibility which could not be achieved with weapons dispersed equally across the front in their organic divisions. Pooling also allowed the division to be reduced in size and gave rise to corps and army level logistic support development.

When the war ended, we realized that many changes had taken place piecemeal and were not documented. To capture the developments of the war years, a board was established to study the infantry division. The board was officially called General Board, United States Forces, European Theater. The board obtained the

views of many World War II combat leaders. As the study progressed members

kept in mind the great advantages of preserving flexibility in the employment of supporting units such as artillery, engineers and others by retaining them in higher echelons rather than assigning them organically to divisions. It has also been impressed with the loss of mobility and maneuverability of the division as units and numbers were added to it. The committee has therefore been reluctant to add units to the division.

On the other hand, ... there are overriding advantages in assigning organically to the division supporting units which habitually had to be attached to it. The committee is supported in this view by almost unanimous opinion of the combat leaders it has questioned. The advantages result principally from greater esprit de corps and teamwork, better understanding operating procedures and an increase in morale of the attached units. These units want to wear the division shoulder patch and to feel that they have a home. (7)

Notably, the Board included some conclusions which expressed concern for the adequacy of artillery firepower, both in number of tubes, mobility and calibre as well as the availability of artillery ammunition. It further indicated a preference for the 81mm mortar over the 4.2in mortar. In any case the post war infantry division came to be divided into three infantry regiments, one heavy tank battalion and a division artillery with four battalions (three 105mm and one 155mm), with a total strength of 17,752. (8) This division was called the Triangular division. However, as with other post-war periods in American history, these became paper divisions -- stripped of their personnel and equipment, if not entire unit elements.

Though many historians point out that the Army was ill-prepared to fight the Korean War, it is important to understand the flexibility built into the division had been removed:

Many of the essential combat elements had been assigned to corps and army pools. Among these were the division tank battalion and the antiaircraft battalion...In other divisions, one rifle battalion was eliminated from each infantry regiment, making a regiment of two battalions. In the artillery, one battalion was dropped and, within the battalions, there were now two batteries instead of the usual three.
(9)

No amount of training is likely to have made up for the "esprit de corps and teamwork, better understanding of standing operating procedures and the increase in morale of the attached units" (10) -- all of which the Board had tried so hard to retain by balancing those units which should be pooled and those essential to the division. This meant that the flexibility was also gone. The army with a division stripped of its ability to adjust to conditions and trained to fight with WWII European tactics faced a new enemy. Further, this Asian enemy did not fight with European tactics:

The old Indian-fighting Army had habituated itself to fluid tactics with elements of guerrilla-style war; the Army of 1950 had long forgotten the tactics of the Indian wars. The Army of 1950 had become roadbound, while the North Koreans and Chinese could move across roadless hills that the Americans customarily thought impenetrable. The Army had become dependent upon artillery support that could not always be available in the Korean hills. The Army had become dependent on elaborate radio and telephone communications that could not always function in the Korean mountains.
(11)

The Board had recommended a division with a strength of 17,752. Yet the actual Korean War strength was 12,500 of the authorized wartime strength of 18,855 adopted in 1951. (12) The weapons of the division were generally the same as World War II: .30 cal rifle, .30 cal. and .50 cal. machine guns, 60mm and 81mm

mortars (supplemented by the former chemical mortar 4.2in) (13), 105mm and 155mm howitzers (later the 155mm "Long Tom" and the 8in howitzer were added). The division did eventually establish superior firepower with improved close support from both the field artillery and tactical air. The Korean war demonstrated the inability of the triangular division to meet all contingencies: "The Korean campaigns demonstrated conclusively that the US triangular infantry division needed complete reorganization to enable the division to respond to any and all conditions of ground combat. The triangular division had fought its last war." (14)

The fix that developed between 1956 and 1961 was known as the Pentomic division. The decision upon five divisional subunits was based upon the notion that threes had proven effective in the attack, but that four and five subordinate units were more adaptable to the defense. Further, planners taking their lead from Clausewitz felt that even numbers were more difficult to control in the attack. Therefore, five became the common denominator for offense and defense. The division was to have both conventional and nuclear capabilities. But in short order the flaws of the pentomic division became evident. (15)

The division maximized dispersion for survival against nuclear attack and stressed defense in depth. Mobility provided the primary tactic to prevent the enemy from concentrating overwhelming combat power at critical points on the battlefield. Command and control was decentralized, with combined arms teams

functioning in quasi-independent fashion. Dispersion, depth, decentralized and mobile were almost mutually exclusive terms in 1956. Fortunately, national policy was in the midst of changing from massive retaliation to flexible response. The pentomic division's lack of flexibility to shift from maximizing its conventional firepower to utilizing its nuclear firepower capability spelled its rightful doom. (16), (17)

In 1961 the Chairman of the Joint Chiefs of Staff sought reorganization to meet with the policy of flexible response. The outcome was the "Reorganization Objectives Army Divisions 1965," also referred to as the ROAD division. The structure was to be basically the same for all types of divisions: three maneuver brigades and a division artillery. (18) Returning to the triangular division format, Roads were formed around a maneuver brigade headquarters to which maneuver battalions of the infantry, armor, airborne or mechanized infantry could be attached and brought together as a cohesive fighting force. The justification for forming around a brigade headquarters, rather than a full-up regiment or maneuver brigade, was to capitalize upon WWII armor experience. We acknowledged that WWII armor units lacked regimental loyalties which impeded cross attachment. In some cases armor brigade headquarters had successfully commanded and controlled up to fifteen maneuver battalions. Such potential for flexible formations of combined arms teams was therefore part of the ROAD division's design. The division strength was authorized at 15,981. (19)

The conventional firepower and mobility of the division increased according to the firepower and mobility of the battalions attached to it. The nuclear firepower of the division came from the weapons of the division artillery; they included 155mm and 8in howitzers and the Honest John and Little John rockets. These weapons also increased the conventional artillery firepower of the division. Beyond its nuclear capability, a ROAD division could be tailored to fit the flexible response scenario.

None of these division models significantly altered the role of the fire support system from that of World War II. The triangular division was oriented toward a 7000 meter front. The pre-Korea division was organized toward a front of 24,000 meters. (20) The frontage for the Pentomic division was designed to be 24,000 meters and the ROAD frontage was 20,000 meters. (21) All of these designed frontages could be ranged by available artillery and doctrinally supported with existing artillery doctrine and tactics. Hence, there was little effort to advance fire support technology.

The development of the division had kept pace, relatively well, with the pace of doctrine and weapons technology to this point in time. Even during the Korean conflict, we successfully responded to circumstances within the framework of existing weapons and doctrine. The fact that division designs focused on organizational structures that provided flexibility, maximized mobility and concentration of firepower without substantive changes in the frontages or size of the force bears this out. With the ex-

ception of nuclear artillery the weaponry of the division had actually changed very little. Maneuver area of influence remained under 1200 meters. The artillery was able to range the division area of influence and area of interest, mass the fires of the division artillery and move with sufficient speed to keep up with maneuver. Proudly referred to as the greatest killer on the battlefield, the King of Battle maintained a great rapport with maneuver and deservedly so.

Then came Vietnam! Too many times the field artillery, fixed on its firebase, could not reach the supported unit or could not respond quick enough to the call for fire. Massing the division's fires was difficult, at times impossible. As for counterbattery, "our ability to locate enemy guns had so deteriorated that, in spite of our preponderance of firepower, enemy mortars and artillery were seldom effectively suppressed." (22) The Vietnam experience once again raised maneuver leaders' critical question: would the field artillery be there next time? This frustration was shared within the field artillery community as well.

The 1973 Yom Kippur War also had a profound influence on Army leadership. Highly accurate antitank missiles, among other weapons advances, signaled that major doctrinal changes of dynamic proportions were required. To that end the Army produced Field Manual 100-5, Operations in 1976. Airland Battle doctrine was born.

Immediately controversy over our ability to implement this

new doctrine with current weaponry permeated all levels of tactical and doctrinal thought. Commanders in the field, especially field artillery commanders, soon grew weary of not being able to explain just how they would implement Airland Battle doctrine during their tour. This environment hastened the search for technological leverage. Promises of a technological fix were soon being espoused by the combat development community. But still embroiled in their Vietnam frustrations, artillery commanders developed local solutions. But overall field artillerymen were confused. And the maneuver community continued to doubt whether the artillery support would be there. The promise of advanced technology fire support weapons did not provide a solution to the division commander preparing to fight the 'come as you are' war he envisioned. As in the past, priority of maneuver shifted to advancing maneuver weapon mobility, lethality and survivability.

In the late 1970's, a new generation of advanced Army weapons and equipment was approaching production and development. The systems would introduce a new and higher level of combat potential to Army divisions. Reorganization has sometimes seemed more reflexive than valid, but the need to reshape organizations and operational concepts to the powerful new weapons that would come into the force in the 1980's was incontrovertible. (23)

In 1976 the Department of the Army directed the United States Army Training and Doctrine Command to study and evaluate the division restructuring. (24)

This vision of a new and lethal landscape had had major implications for doctrine, training, weapons and organization. It had influenced profoundly the themes of the new FM 100-5, Operations, begun in 1974 and completed two years later. From FM 100-5 had flowed a new generation of training literature including the

"how-to-fight" manuals, conveyed by new teaching vehicles and methods. If anything, the Sinai and Syrian battles had demonstrated the unprecedented destructive power of modern weaponry, U.S. and Soviet. The increase in weapon lethality underlined the significance of the U.S. Army's accelerating programs of the mid-1970's to draw abreast of the Soviets in new weaponry development, which had suffered severe budgetary neglect in the preceding "Vietnam decade." ...it had become apparent that adaptive tinkering could not go to the heart of the problem highlighted by the Mideast War and resulting studies." (25)

This new division, Division 86, was to be developed around weapons systems and tactics -- tactics that took advantage of their best mode of employment. Though Division 86 never fully came into being for a myriad of factors, its focus on weapons systems and tactics tied the ability to execute new tactics to the fielding of the new weapon systems. The result was a quantum leap forward in maneuver mobility, firepower and the geography the division was able to cover.

Imbalances occurred in unexpected and significant areas. Notably, Firefinder Radars (Artillery Locating Radar AN/TPQ-37 and Mortar Locating Radar AN/TPQ-36) with phased array antenna techniques could locate numerous enemy indirect fire weapons simultaneously. But the division artillery, armed with its three battalions of 1977 vintage M109A2 155mm howitzer (26) and one battalion of 1978 vintage M110A2 203mm howitzer (27), had insufficient range and firepower to service this plethora of targets without obvious sacrifice of weapons available for direct support.

For the 'come as you' are war, the dilemma facing the divarty was profound. More than ever the division commander

needed extremely responsive fire support for the intense close battle and his fire support officer appeared enamored with devoting his fire support assets toward the indirect fire duel. The alternative was to parochialize and call for more artillery to be put under the division's direct control so it would be there when needed. World War II General Board conclusions be damned (28), pooling be damned, the situation was not a question of where to put weapons the division commander might need if he had the main effort: Rather, the situation was that there wasn't enough artillery in the division artillery to support his basic mission. Promises that more lethal, more mobile, longer ranged artillery were being developed only served to make the situation more parochial. Inevitably, maneuver commanders sought artillery organic to maneuver brigades for direct support. Beyond that, let the artillery worry about artillery for it's indirect fire, artillery duel.

ENDNOTES

1. (Chart), Evolution of the Division Span of Control, Equipment, and Tactical Doctrine, Produced by United States Army Command and General Staff College, 16 February 80.

2. Russell F. Weigley, History of the United States Army, pp. 440 and 461-463.

3. Virgil Ney, Evolution of the US Army Division 1939-1968, p. 31.

4. This division had three infantry regiments and an artillery regiment, with a total fielded strength of 10,275 as compared to the 1918 square division strength of 28,105. The division weaponry was the .30 cal. rifle, .30 cal. and .50 cal. machine guns, 60mm and 81mm mortars and the 75mm, 105mm and 155mm howitzers. The WWI standard had an authorized strength of 28,105 as compared to an actual strength of 10,000 in the Civil War divisions.

5. (Chart), Evolution of the Division Span of Control, Equipment, and Tactical Doctrine, Produced by United States Army Command and General Staff College, 16 February 80.

6. Ney, p. 49.

7. Ibid., p. 52.

8. Ibid., p. 57.

9. Ibid., p. 59.

10. Ibid., p. 52.

11. Ibid., p. 60.

12. (Chart), 16 February 1980.

13. Ney, p. 66.

14. Ibid., p. 70.

15. Ibid., p. 71.

16. Ibid., pp. 71-75.

17. The doctrinal concepts upon which the pentomic division was structured have not died with the structure. As thinkers draw upon available technology and available doctrine the mix does not always work. But like the Studabaker, the doctrine of the pentomic division was just a little ahead of its time. Many doctrinal thinkers today advocate brigade sized combined arms teams operating semi independently on a battlefield marked by wide frontages created by the need to disperse for survivability. Similarly, the technology to command and control subordinates in this environment is the aim of much R&D effort.

18. Though changes did occur throughout these years that affect the support, I have concentrated on the main combat force. Significant changes in support were: the establishment of the Division Support Command in the ROAD; establishment of the G5 in the Pentomic; IG, JAG and Information officers made 'Special Staff' in the ROAD. The lack of logistic support development is left for another day.

19. (Chart), 16 Feb 1980.

20. In Evolution of the US Army Division 1939-1968, Ney provides a comparison of US and Korean division frontages on the

Pusan Perimeter;

<u>Division</u>	<u>Front Yds.</u>	<u># Of Infantry</u>
3rd ROK	70,300	5/6000
Cap ROK	38,100	4/5000
8th ROK	41,800	5/6000
6th ROK	41,800	6/7000
1st ROK	34,400	5/6000
1st US (Cav)	103,600	6/7000
24thUS (Inf)	59,200	6/7000
25thUS (Inf)	81,400	6/7000

This like the WWII divisions was by necessity based upon the terrain and the situation and not by design.

21. (Chart), 16 February 1980.

22. David E. Ott and Donald M. Rhea, "Counterfire," Army, July 1976, p. 22.

23. John L. Romjue, A History of Army 86, Vol. I, p. v.

24. Ibid.

25. Ibid., pp. 2-4

26. "Self-propelled Guns & Howitzers/ USA," Jane's Armour and Artillery 1983-84, 1984, p. 510.

27. Ibid., p. 505.

28. These conclusions, not previously stated herein, found that "the corps artillery organization for combat is one of the most important factors influencing the artillery support rendered a given operation." That, "The flexibility of organization permitted the massing of artillery ...and insured the maximum support for the main effort." For more study see, "Field Artillery Operations," Report of the General Board United States Forces, European Theater, n.d. section 81, study number 61.

CHAPTER IV

EVOLUTION OF ARTILLERY SUPPORT

The Napoleonic era had affected the organizational flavor of the early American division. Likewise, the Napoleonic style of using artillery offered a substantial model upon which to develop American artillery. In the Napoleonic system, horse-drawn artillery advanced to the front lines just beyond the range of the enemy's muskets and fired on the enemy's ranks. Then maneuvering infantry attacked the softened enemy and gave the offense new meaning. American artillerymen, aware of the impact of this mobility breakthrough and the tactical advantage it provided, pressed for the introduction of horse drawn light artillery in the American Army. Support was provided in the Presidential Act of April 12, 1808. Peter's company, a battery of light artillery, became the first battery formed on the Napoleonic model. Even though the battery proved effective, in early 1809 President Madison's Secretary of War, William Eustis, "decided that horses were a waste of money and sold them." (1) This was an early signal of how things would be for the artillery.

Another event of that day portended that American artillery would have a hard row to hoe. President Madison was faced with increasing British aggression. Concern for defending American interests with military force was rising. Even so, he faced the conflicting concern of an excessive national debt. Nonetheless, President Madison recommended bringing the Regular

forces to full strength, recruiting 20,000 additional troops and legally requiring the states to arm their militia. Also, Madison's Secretary of Treasury, Albert Gallatin, requested a budget which would eliminate the national debt by cutting military expenditures by 50 percent. This ambivalent regard for the preparedness of military forces would for much of the future make military technological advances hard to come by. Advances in general would depend upon the perceived immediacy of a threat. US defense would rely primarily on the less costly militia, rather than a well-equipped active army. (2)

Thus the War of 1812 provided its humiliations, not the least of which was the sacking of the Capitol. This gave rise to post war support for proposals to build a standing regular army upon which to formulate and carry out an American military policy. Yet by 1847 a division standard was still not established. Even so, the artillery battery in the divisions was the light horse artillery of Napoleonic style. For the American artillery, this advance came on the tail end of an era of artillery supremacy:

From the middle of the eighteenth century to the middle of the nineteenth, artillery is judged to have accounted for perhaps 50% of the battlefield casualties. In the sixty years preceding 1914, this figure was probably as low as 10%. The remaining 90% fell to small arms, whose range and accuracy had come to rival that of the artillery. (3)

By the Civil War rifling had provided the musket with accuracy and range sufficient to neutralize the standoff advantage previously enjoyed by the cannon. The offensive nature of artil-

lery was reduced, and its defensive potential was expanded. Though advances did occur in artillery technology -- in rifling, exploding and canister shells and the use of railway artillery (4) -- they were not timely enough to overshadow maneuver tactics and technology. The artillery became a responder to the needs of maneuver instead of a generator of maneuver.

Artillerymen in the field had to depend upon precision of drill and procedure in order to improve mobility and provide fire support. Artillery was brigaded at corps level and on occasion organized with the division for the conduct of a battle. (5) During this supporting role, advancements in tactics began to evolve from direct fire into indirect fire. Though the idea of indirect fire had been around since the mid-eighteenth century, it was not until the first World War that there was a true need for advancing artillery's 'technical' capability. (6) Previously, the commanders could mass fire by massing the pieces themselves. In tactical situations, dominated by maneuver, the mobility of the cannon forced artillery to become light. As long as commanders could rapidly bring together sufficient cannons a firepower advantage could be created. However, when the cannon's range advantage was neutralized by the rifle and concealment lost by the use of smokeless powder, the cannon could only survive out of the sight of the enemy:

[T]he withdrawal of the artillery to cover was widely resented by other arms, which still preferred guns to deploy in amongst them. The Gunners were poor advocates of their case....Gunner introspection led Colonel Knox, the British military attache in Russia, to note that the artillery 'never thinks of the necessity for practical cooperation with the infantry'.

The problem was not confined to Russia. It is ironical that the tool which would revolutionize the provision of close support would be largely ignored until armies were shocked into using it by the First World War. (7)

Adding to maneuver's scepticism was the fact that light artillery could not achieve the necessary ranges. To do so, artillery got heavier and less mobile. This led to a more static battlefield. Improvements in target acquisition, fixation (locating things on the ground through survey), and command and control allowed artillery to be called forward to attack 'infantry in the open' with relative impunity. (8) Then the battlefield became even more static. This caused an increased need for artillery to focus on attacking the enemy's artillery. Eventually, then, counterbattery fires gained in importance.

In 1914 European armies and their artillery had little idea what shape the coming war would take. They all regarded artillery as an accessory rather than an essential arm, supporting infantry in mobile operations under what in practice was a decentralized command. There was no question of truly combined arms planning, and while CB fire was deemed necessary, it could not be carried out effectively in the mobile war scenario. ...in 1914 none had settled the outstanding issues: ammunition resupply, the use of heavy artillery, the concealment and protection of guns, the organization of C2 at high levels and the need to improve communications. When war came the resolution of these problems would tip the balance away from mobility to satisfy the imperative -- firepower. (9)

Despite apparent over-simplification, little is different today. The issues of ammunition resupply, the use of heavy artillery, the concealment and protection of guns, the organization of C2 at high levels and the need for improved communications still tip the balance away from mobility to satisfy the imperative, FIREPOWER. The technical advancement of indirect fire procedures

was a natural phenomenon -- one which would lead the artillery down a path separate from that of maneuver forces.

J.B.A. Bailey expresses this divergence in very clear and accurate terms:

The First World War demonstrated the importance of firepower and fire mobility, but revealed the difficulty of providing these in close support during mobile operations. After the war political and economic constraints thwarted the realizations of the ideas of armoured warfare that were widely discussed. By the late 1920's experimental armoured formations existed with integral, and in some cases SP and anti-tank, artillery. These formations and their tactics were the logical consequence of the experience of the First World War, and were artillery's attempt to maintain close fire support by equipment mobility rather than fire mobility.

By the early 1930s imagination had outstripped experience. Both armour and infantry sought independence from artillery firepower, either by enhancing their own, or by calling on aircraft. The SP was abandoned, and wheeled artillery left vulnerable in the forward combat zone, assuming it could keep up with the battle. Having lost equipment mobility, artillerymen tried to compensate by improving fire mobility.

In mobile operations fire mobility could be achieved only through improvements in radio communications, survey and accuracy; but these were hard to perfect. The shortcomings of armour and airpower operating alone would be revealed in the Second World War; and the mobility of artillery equipment soon restored to improve support for them. The return of equipment mobility coincided with the development of improved techniques of gunnery, and was to revive artillery's influence on the battlefield in a way few had predicted ten years earlier. (10)

The Report of the General Board United States Forces, European Theater bears this out:

The application of firepower precedes successful maneuver and its ultimate purpose is to completely destroy or so neutralize the enemy that the maneuvering elements can take objectives without loss of life or injury to our personnel. On rare occasions the ultimate has been reached in this war, frequently ap-

proached, at times disregarded. Fire destroys the enemy's communications, forces him to abandon his observation and weapons, prevents movement of units on or into the battlefield and inflicts casualties. Movement covered by fire, smoke, or darkness, permits closing with the enemy and results in his capture or destruction. The advantages of movement covered by fire are obvious in that fire is much easier to control as to location and intensity. Field Artillery forms a major portion of the firepower available to the commander, (11)

Significant advances in fixation techniques, target acquisition and communications equipment and procedures occurred during WWI. They made it possible for artillery to maintain a mobility parity with maneuver without sacrificing accuracy and timeliness. Both of these capabilities were cited as key factors in artillery employment by the Board. (11) These advances, however, were to be short lived and tended to perpetuate artillerists' preoccupation with the gunnery solution and equipment mobility at the expense of firepower mobility.

The maneuver forces were supported well in World War II and Korea by the King of Battle. The tension between maneuver and artillery was somewhat abated. Mobility had been restored to the battlefield and the artillery had shown its ability to move, shoot and communicate well. However, the first substantial test of this new-found pride came under conditions not well suited for conventional force employment, namely Vietnam. In Vietnam mobility was not achieved through the use of ground vehicles; it was achieved through aviation. Thus fire support could not always go where the infantry went, and fire mobility had been neglected by the artillery in the hey-days of WWII and Korea. Fire support bases and aerial field artillery in the form of attack helicop-

ters filled the gap. The ability to mass artillery fires became a matter of proximity of the fight to a fire support base instead of a matter of gunnery. The infantryman would often instead call on air power, fixed wing or helicopter. He began to rely upon these as the weapons of choice over the artillery. As was the situation prior to WWI, maneuver and artillery seemed once again to be going their separate ways.

Counterbattery fires were equally inept. "By the time of the Vietnam war ...our ability to locate enemy guns had so deteriorated that, in spite of our preponderance of firepower, enemy mortars and artillery were seldom effectively suppressed." (13) Target acquisition systems had not been kept current. Countermortar and counterbattery radars were reactive and proved too slow to detect rocket and mortar fire employed by elusive guerilla forces. Sound and flash ranging equipment was WWII vintage. Both required survey support, which proved too slow to match mobility requirements, not to mention spare parts shortages which rendered the systems inoperative for extended periods of time. Vietnam was a frustrating time for the field artillery. And post Vietnam doctrinal solutions did not end the frustration.

It is safe to assume that on future battlefields, initially at any rate, our artillery may be outnumbered at least four to one or more. However, it is not enough to simply say that the threats the U.S. Army faces are large and forboding; we must look to a whole set of tactics and the way in which the next war will be fought -- one that will take all the combat power and skill we can muster. (14)

The development of Division 86 and Airland Battle doctrine emerged as the Army's new way at looking at war. This restructur-

ing included a whole set of new tactics. But it highlighted as well a new set of old problems for the artillery: the division was formulated around "...the powerful new weapons that would come into the force in the 1980s..." (15) But these new systems did not all come into the Army in the 1980s, and many would not come at all. The weapons that did come into the force were predominately maneuver and aviation weapons; they dramatically increased infantry and armor lethality, mobility and the range at which the enemy could be engaged with direct fire weapons. The artillery was to continue with M109 and M110, 1977 vintage howitzers which did not have the mobility of the new tank and infantry fighting vehicle nor could they range the depths the new doctrine called for. Survey techniques, though enhanced with Position Azimuth Determining System (PADS), were still woefully incapable of providing survey to direct support artillery at maneuver speeds and depth of attack. Target acquisition rested solely in the arms of the TPQ-36 and TPQ 37 artillery and mortar locating radars. Though these radars could rapidly locate targets in large numbers, they were nonetheless survey dependent, slow to emplace, and vulnerable to detection.

The bright spot for the artillery was the Multiple Launch Rocket System (MLRS). It provided a quantum increase in firepower, lethality and mobility. But it was not a stand-alone system. Therefore, its mobility was decreased by its requirement for survey update; its lethality was degraded by a lack of adequate target acquisition systems; and its firepower less responsive be-

cause artillery command and control was a mixture of automated and non automated fire control systems.

As artillery commanders struggled to make their available weapons fit the new doctrine, they focused on procedures, drill, and emplacement/displacement techniques. They developed local tactical solutions to maneuver operation plans. The Field Artillery School combat developers worked the requirements for advanced target acquisition systems, advanced survey and meteorological systems, fire control systems and advanced canon and rocket systems. Doctrinal and organizational changes were developed, but these were tied to the fielding of equipment that could do the job. The check was still in the mail!

Unfortunately, developing and fielding equipment took time and money that were not always available. Adding to the difficulty was the requirement to field an increased number of divisions. Spaces were needed. People became bill payers for the increased structure. Adjustments to existing structure were inevitable. Some of them were counterproductive to artillery modernization efforts. Consequently, commanders in the field could only make the best use of what was available and work to buy time until the combat development community could field needed equipment.

Division artillery became the focus. Target acquisition batteries became organic to the divarty. An MLRS battery replaced one of the 8in howitzer battalion's batteries in the divarty. The artillery battalion's three batteries of six howitzers (3X6) were

restructured to three batteries of eight howitzers (3X8). These moves were necessary, given the situation. But they further fostered the belief that the artillery would not be in the next fight.

Divarty, with or without additional cannons and MLRS, did not move, shoot, or communicate fast enough to keep up with the maneuver without leapfrogging, which reduced available artillery considerably. The weapons could not range the division's area of influence. In fact, they could not range the division's frontage. Hence, divarty could not mass its fires. The addition of the counterfire mission, indicated by the assignment of the target acquisition battery to division and nowhere else, increased the requirement and directed the artillery's attention further away from direct support of troops in contact.

The Army thus left the 1980s with its new doctrine in place but without the "new generation of advanced Army weapons and equipment" (16) around which that doctrine had been built.

The ramifications of reversals, such as those faced by Peter's company, and requirements for modernizing artillery at the end of an era have compounded themselves. We are currently going through one more iteration. Artillerymen's near obsession with perfecting indirect fire gunnery techniques at the direct expense of rapid fixation, target acquisition, meteorology, increased range and mobility impacts profoundly upon the development of advanced artillery systems and artillery tactics. This same preoccupation has distracted artillerymen from such a

critical subjects as advanced ammunition supply to support faster and longer shooting weapons, the role of heavy artillery beyond counterfire, organizing for better command and control in order to provide a highly mobile battlefield with balanced and sometimes lead-the-way firepower. (17)

Until the late 1980s, our concentrated concern on indirect fire did not allow for deliberation of many other worthwhile concepts: pushing artillery forward, leading with a counterfire program coordinated by corps artillery, networking of target acquisition and weapons without processing the data through force artillery headquarters. What we do in the next ten years will either unify and advance the artillery or return us to a highly trained, under equipped supporting arm, whose dependability is suspect and whose ranks are divided.

ENDNOTES

1. Russel F. Weigley, History of the United States Army, p. 111.
2. Ibid., pp. 112-116.
3. J.B.A. Bailey, Field Artillery and Firepower, p. 5. A more detailed account of this statement can be found on pages 116-120.
4. (Chart), Evolution of the Division Span of Control, Equipment, and Tactical Doctrine, USACGSC, 1980.
5. Ibid.
6. Bailey, p. 118.
7. Ibid., p. 119.
8. Weigley, p. 390.
9. Bailey, p. 125.

10. Ibid., p. 165.

11. J.D. Balmer, "Field Artillery Operations," in Report of the General Board United States Forces, European Theater, p. 95.

12. Several articles from Field Artillery Journal during the mid seventies demonstrated the frustration of Vietnam artillery support and the affinity to look to gunnery for the solution. See: Vernon B. Lewis Jr., "Evolving Field Artillery Tactics and Techniques," Field Artillery Journal, January February 1975, pp. 44-48.; Robert G. Tetu Jr., "Fire Support Symposium," Field Artillery Journal, September - October 1975, pp. 52-55., are examples.

13. David E. Ott and Donald M. Rhea, "Counterfire," Army, July 1976, pp. 22-26.

14. Ibid., p. 23.

15. John L. Romjue, History of Army 86, p. v.

16. Ibid.

17. An excellent source for further study of the development of specialized functions of the artillery is Field Artillery and Firepower, by J.B.A. Bailey. Remember while reading that Bailey is speaking from the British perspective and many subtle failures within the American community are not evident.

CHAPTER V

CONCLUSION

The developmental paths of the infantry division and the field artillery have not been parallel. In fact, they have seldom been mutually supportive. Times of crisis have generally provided the motivation to drop parochialism and work a common solution. The development of counterfire, both its capability and doctrine, has been a subset of both the division's and the artillery's development. The infantry resented the withdrawal of the artillery from the battlefield in the mid-nineteenth century. It put its priority into infantry mobility and firepower to make up for its confidence in artillery and firepower. Avoiding any break with tradition, artillerymen concentrated on developing indirect fire gunnery and accuracy. In turn, they have given low priority to counterfire, except to subordinate the two most important parts of accuracy, survey and meteorology, to target acquisition. (1)

The early events of both World War I and World War II demonstrated the need for counterfire, then counterbattery, in order to suppress and silence enemy artillery and to allow the infantry freedom to maneuver. Development of the division and of artillery came together ironically over their joint need for counterfire.

Their paths only crossed, however. Post-war periods brought renewed neglect of counterfire. (2) Korea came so close on the heels of World War II that counterfire technology and techniques

of the earlier conflict were well suited for the Korean War. As a matter of fact the sound ranging equipment used in 1972 in Vietnam were 1942 vintage systems. Vietnam was not a good war for counterfire developments, nor did it provide another meeting point for divisional and artillery restructuring.

The Yom Kippur War forced division restructuring upon us. We looked at functions on the battlefield of the future, instead of the battlefield experience of the last war. This engine of change provided a unified evolutionary strategy in which advanced weapon systems, new structure, doctrine and training techniques gave the Army parallelism. The developments tended, however, to be success dependent. Thus they were fatally linked one to the other, giving the impression that development was an all or nothing proposition.

In the past, the Army has not gotten everything it has asked for in the way of people and equipment. It should not expect to in the future. As the realities of the federal deficit, the expense of advanced weapon systems and a threat oriented strategy have reduced available dollars in the mid-1980s, weapons system cancellations rose in frequency. Battlefield deficiencies for which these cancelled or threatened systems were the solution did not go away. A new wave of parochialism arisen over the need for available dollars.

These tensions will continue, perhaps increase, during the 1990s. The majority of the advanced artillery systems are still checks-in-the-mail. Without the advanced systems, how can the ar-

tillery ensure sufficient artillery in the division to execute its indirect fire support requirements of close operations? That is, how can it support troops in close combat and counterfire? The key is a properly equipped and organized field artillery brigade.

To support this solution, we must recognize the need for maneuver to have artillery it can count on; recognize that pooling of critical assets, in this case artillery, above division is both necessary and desirable; and prioritize material acquisitions in a way that will mature our existing capability. Thus we can ready ourselves for emerging capabilities and merge the present and future, rather than segregating them.

A division artillery organized with three 155mm, self-propelled M109A3 battalions (3X8), an Multiple Launch Rocket System Battery and a Target Acquisition Battery has sufficient firepower to provide direct support for the division in general. However, divarty mobility, that translates self-locating survey, must be enhanced if we want to mass the fires of units which must be on the move either for survivability or to keep up with their supported maneuver force. Self-locating survey is also an essential for future weapon-sensor linkage on the Airland Battle battlefield. In the shorter term, it allows the artillery to stay with the maneuver. This capability will resolve some of the resentment and worry about where the artillery is, where it will be when the fight starts, and what it can deliver as the battle rages.

The technical capability to link MLRS and TPQ-36/37 artil-

lery and mortar locating radars (Firefinder) exists now; it should become doctrine. The radar has the capability of accepting the maneuver commander's priority for counterfire attack through Critical Friendly Zones. Enemy weapons firing in these zones can be rapidly located by Firefinder. The data is then digitally transmitted to the MLRS Fire Control System and executed by a launcher. The process needs no additional handling by an intermediate headquarters. Given priority for self-locating survey, the divarty on the ground today can provide sufficient fire support to accomplish its Table of Organizational and Equipment mission.

However, if that division is given the main effort or designated by the corps commander to receive additional support to weight the battle, additional artillery support to meet the mission will probably be required. This additional support requirement can be met by the Field Artillery Brigade (FAB). What then can it provide in the way of support for the division close operations, specifically, troops in close combat and counterfire? What support can it provide for division deep operations?

The corps artillery, through mission assignment of a FAB, can provide a wide range of artillery support: 155mm and 8in cannons, MLRS, and Lance Missile systems. But weapons systems are not enough. Though the FAB does have a headquarters which has a limited ability to function as a force artillery headquarters, it does not have the capability of a division artillery headquarters. In fact, when the Field Artillery Brigade (FAB) arrives, it may not be TACFIRE capable, whereas the supported divi-

sion may be TACFIRE capable. The division will have great difficulty passing technical fire control data, fire plans and tactical operations orders to the FAB. The FAB will increase demands on the division forward support brigade for ammunition support. The brigade will increase demands on the divarty survey section for survey control to each battalion. And the FAB does not have organic target acquisition capability with which to weight the counterfire portion of the mission. Therefore the FAB tends to increase the command and control demands placed on the divarty headquarters.

In its current organization, pooling artillery at corps level has limited application. The value of pooling resides in the ability of the pooled equipment to rapidly reinforce the battlefield units with minimal draw on these units' resources. Thereby pooled resources concentrate combat power when and where the commander decides without reducing the flexibility and mobility of the subordinate organization. Since the FAB does not currently have the capability to do so efficiently and effectively, I can not suggest that artillery pooled in the form of the FAB is the answer to the division artillery's support requirements?

Simply put, the organization and capability of the FAB is the problem, not the strategy of pooling. If it were organized with a Fire Support Element, a Target Acquisition Battery, a Forward Support Company and a Fire Support Team, the FAB would be capable of significantly weighting the battle without conflicting with a supported division's standard operating procedures, or requiring time-consuming adjustments to them.

The FAB would be capable of plugging in to the reinforced divarty's existing operation. It could reinforce any part of the divarty's fire support mission as may be selected by the division's Fire Support Coordinator, the divarty commander. The FAB's 155mm battalions could be assigned reinforcing missions to the direct support battalions. The FAB's fire support team could be apportioned to support the reinforcing mission. FAB survey section, out of the target acquisition battery, could immediately begin to extend survey control from the division survey control point (SCP) to the reinforcing battalions, thereby establishing common control while the battalions were still closing on their positions. The FAB's Fire Support Element could be used to function as the force artillery headquarters for rear operations and tie into the division main CP without augmentation. The FAB's target acquisition battery, 8in battalions and the MLRS battalion could be given the mission to reinforce the divarty counterfire operations. Such a program would totally free the divarty commander to concentrate his efforts on counterfire, all the while giving him significant firepower to provide the division with fire mobility in support of the division's main effort.

In the same situation the divarty commander would have the flexibility to establish the FAB as the counterfire headquarters for the defense. Then he could concentrate his efforts totally on fire support coordination of the division's close combat fight. In both scenarios, artillery support would be balanced, adequate and responsive.

On a linear battlefield, similar support could be provided to security zone forces. As forces in the rear area enclave are preparing to conduct any number of operational options, they will be hesitant to give up their divarty -- or any portion thereof. Without reorganization of the FAB as outlined above, the corps commander would have no option except to take target acquisition, fire support teams and fire support augmentation from the division artilleries. Reorganized, the FAB could move forward to reinforce one or more cavalry regiments. Or one or more FABs could move forward and support several enclaves of security forces. Support would nearly mirror the direct support functions of the divarty and provide significant counterfire capability. Additionally, the FAB command, control and communications would facilitate the battle within an enclave and provide plug-in capability to any division conducting supporting operations.

In certain cases, the corps commander may decide to lead a passage of lines with pre-positioned artillery to conduct a counterfire plan to gain fire superiority at the time of passage. The corps artillery commander could execute such a mission without stripping the divisions of their target acquisition batteries. Stripping organic divisional assets can detract dramatically from cohesive combat action, even when the logic of the situation supports the action. However, pooling reverses the situation: it provides the lower echelon with support or a capability it does not have at a critical time and place on the battlefield; thus it engenders cohesiveness and raises morale. It becomes a force multiplier, not a force detractor.

These examples, though very general, demonstrate that the requirement to conduct counterfire is a function of the battlefield, not a mission for a specialized organization. Any artillery organization assigned the mission of supporting close operations must have or be augmented with the capability to do counterfire. Assigning artillery to the division sufficient to completely support close operations is too costly and denies mobility and flexibility. (3) (4) Ignoring the advantage gained by pooling critical artillery assets in highly responsive and balanced corps level organizations will only continue the segregation between supported and supporting arms. It will leave the divarty commander with a situation he cannot manage.

There is another reason for maintaining an organization that pools responsive artillery above division: it provides an optimal organization in which to field advanced artillery systems to maximize their use on the battlefield. Without the FAB, we have no choice other than to repeat the complications experienced in the fielding TACFIRE.

Assume for a moment that every FAB had TACFIRE. No matter which division it supported, the division's operation would be enhanced. The FAB would bring to the division a capability it did not have and would not cause the division to change its standard way of doing business twice, once upon arrival and once upon departure. But this is precisely the awkward situation when TACFIRE is in the division and not the FAB. Since TPQ-36/37 can communicate digitally with the MLRS Fire Control System without

TACFIRE, the division, not supported with a FAB, has not lost the counterfire response, which is lacking when their acquisition and weapon system is not being networked. When the situation calls for FAB reinforcement, the TACFIRE capable FAB is capable of reducing the divarty's command and control as requested to include networking all target acquisition radars and MLRS. On the other hand, with the TACFIRE in the divarty and not the FAB, TACFIRE is quickly overloaded from trying to network the entire fire support plan.

Surely, the optimal situation is to have both organizations TACFIRE capable. But money, time or readiness constraints have prevented simultaneous fielding. Thus fielding the FAB first maximizes the combat power through pooling. It also serves to enhance the fielding of the division systems by forming a pool of experienced operators, repairmen, and doctrinaires. In this way the FAB becomes a key organization for fielding future systems.

Many future systems will include or augment those of the Information Management Area. (5) They will be oriented toward a linear battlefield. This will demand that continuity, security, versatility and simplicity are maintained during fielding. The pooling applies well, especially to the field artillery. The affects such Command, Control and Communications systems will have on fire support procedures presents an excellent topic for future Army War College study.

Advanced field artillery systems such as the M109A2/A3 Self-propelled Howitzer/Howitzer Improvement Program (HIP) and

the follow-on Advanced Field Artillery System howitzer will greatly increase the ability of field artillery units to service an increasing number of targets without a corresponding increase in the number of howitzers. Such advances will increase the demand for ammunition drastically. Therefore, ammunition supply methods and ammunition packaging must be upgraded, taking advantage of advancing technology. Liquid propellents could reduce transportation lift and storage requirements. Pre-fuzed projectiles packaged in magazine or coke machine delivery systems could drastically reduce the need for soldiers to handle each round. This automation potentially reduces the physical demands on artillery crews, which are smaller in size on the advanced systems. I recommend future Army War College students study the impact increased volumes of artillery fire will have on logistic and transportation capabilities to deliver ammunition. We can no longer afford parochialism; we need to develop comprehensive combat, combat support and combat service support solutions to battlefield functions and requirements, not simply to enhance maneuver.

As a first step, we the field artillery community cannot afford to enter the 1990s with a house divided over who should conduct the counterfire mission. Though we have come by the controversy honestly, it has no place in the future. Counterfire is not a separate battle. As part of close operations, it must be balanced, through the application of all combat power, to provide adequate fire support to close combat operations. And it must be

done without sacrificing that same maneuver force to the fires of threat artillery. Counterfire is therefore not limited to the assets available to a division artillery or restricted to those of the corps artillery. Success on the battlefield requires freedom of movement of friendly forces. Since threat artillery is targeted against and has the capability to kill and disrupt friendly forces movements, success of the counterfire fight is important to the maneuver forces. Therefore, active and affective control of counterfire is essential. Who fights the counterfire fight is a matter of proximity and capability. The Field Artillery Brigade, with some modification, is the optimal solution to the division artillery's requirement for additional firepower. It is also the optimal solution to the corps commanders need to influence the battle by weighting the fight with critical assets.

ENDNOTES

1. Survey was first required in sound ranging. It became important for cannons to be fixed on a common geodetic grid with sound ranging in order to accurately attack located enemy cannons. Survey never did gain the attention of the gunnery experts except when accuracy was in question. Survey was so ignored that by the Vietnam War it was generally accepted as unnecessary. Often cannon commanders would attempt to register using radar, but throw away the results because the corrections seemed so large. In fact the radars were on valid survey and cannons more often than not used assumed grid coordinates. Further showing the lack of attention given to this important accuracy factor, the survey capability available in Vietnam was totally inadequate for the airmobile, guerilla environment. Throughout the war survey capabilities did not change one bit.

Meteorology fared no better. Vietnam gave little incentive to change. Adjust fire techniques were simply not updated with MET. For those who doubt this willingness to ignore MET, look at TACFIRE. There

is no capability to input MET tapes, each line is entered manually through the key board. This is a time consuming process. TACFIRE was outfitted with a standard MET override capability, regardless of the fact that standard MET NEVER exists.

By the 1980s self-locating equipment was being developed for howitzers according to specifications which failed to meet fixation requirements for howitzers. Survey teams became bill payers for other structure. Meteorology was building an automated system which increased the crew, transportation requirements and provided no appreciable increase in coverage or interface with TACFIRE. Sound ranging and flash ranging were out 'bill paid' out of the structure. And the corps artillery had NO target acquisition collection or coordination capability, not even a survey information center.

2. J.B.A. Bailey, Field Artillery and Firepower, pp. 51-64.

3. Virgil Ney, Evolution of the U S Army Division 1939-1969, pp. 36, 38, 43, 49 & 52. Ney quotes several sources which reinforce the notion that bigger isn't necessarily better when conducting combat operations. In fact, each source clearly identifies that over extension of control occurs when organizations get too big. When control is stretched too far mobility and flexibility suffer. In the modern scenario the division artillery becomes immobile and inflexible when required too control the assets required to totally support close operations.

4. Those who espouse organic maneuver brigade artillery and massive division artillery organizations need to review the historical genesis of the concerns that drive such thought. Combat lessons learned, as articulated in the General Board United States Forces, European Forces, from world war II offer strong experiential facts that strongly indicate the opposite.

5. I am referring to the Army Tactical Command, Control and Communications System (ATCCCS). As Mobile Subscriber Equipment (MSE), Multi-channel Tactical Satellite (M/C TACSAT), Single Channel Ground and Airborne Radio Systems (SINCGARS), Enhanced Position Locating and Reporting System (EPLRS) and other communications systems enter the force, fusion of information must occur from the top down in the pooling model until the entire force is fielded if we are to retain continuity of effort.

As the Battlefield Automation System (BAS); Maneuver Control System (MCS), Advanced Field Artillery Tactical Data System (AFATDS), Forward Area Air Defense for Command Control and Intelligence (FAADC²I), All Source Analysis System (ASAS), Combat Service Support Control System (CSSCS) and Corps Theater Automatic Data Processing Service Center (CTASCI) is fielded a top down fielding is essential to avoid the confusion of higher headquarters being incapable of augmenting subordinate units or worse neutralizing the value of the systems because the subordinate can not plug into the superior.

BIBLIOGRAPHY

Books

1. Bailey, J.B.A. Field Artillery and Firepower. Oxford: The Military Press, 1989.
2. Lind, William S. Maneuver Warfare Handbook. Boulder and London: Westview Press, 1985.
3. Weigley, R.F. History of the United States Army. New York: Macmillan Co., 1967.
4. Willoughby, Charles A. Maneuver in War. Harrisburg: The Telegraph Press, 1939.

Institutional or Organizational Reports

1. Allied Forces, 12th Army Group. Report of Operations. Vol. 11: Antiaircraft Artillery, Armored, Artillery, Signal and Chemical Warfare Sections.
2. Army, First United States. Report of Operations 23 February - 8 May 1945. Vol. 2: Report of Operations. Pp. 87-111: "Artillery," _____.
3. Army, First United States. Report of Operations 1 August 1944 * 22 February 1945. Vol. 3: Artillery Section Report.
4. Drews, Frederick., et al. Soldier Performance During Continuous Field Artillery Operations. Carlisle Barracks: Physical Fitness Research Institute, 1987.
5. Daley, John M., et al., ed. Doctrinal Essays on Airland Battle and Echelons Above Corps. Carlisle Barracks: US Army War College, March 1984.
6. General Board United States Forces, European Theater. Report of the General Board United States Forces, European Theater. APO 408: not dated. "Field Artillery Observation Battalion," by Brig Gen J.D. Balmer.
7. General Board United States Forces, European Theater. Report of the General Board United States Forces, European Theater. APO 408: not dated. "Field Artillery Operations," by Brig Gen J.D. Balmer.
8. Ney, Virgil. Evolution of the US Army Division 1939-1968. Ft Belvoir: United States Army Combat Developments Command, Combat Operations Research Group, 1969.

Journals and Magazines

1. Abshier, John C. "Heavy Artillery- Who Needs It?" Field Artillery Journal, September-October 1976, pp. 31-33.
2. Akimov, A. "Fighting Tanks." Soviet Military Review, October 1976, pp. 10-13.
3. Barham, Thomas. "Getting Along With Grunts." Field Artillery Journal, March-April 1975, pp. 35-36.
4. Bodlien, Karl Heinz. "Artillery Projects of the Future." Field Artillery Journal, January-February 1976, pp. 10-15.
5. Brown, Dallas C. "Conventional Warfare in Europe --The Soviet View." Military Review, February 1975, pp. 58-71.
6. Cherry, John F, "Mounted Combat." Infantry, September-October 1975, pp. 12-15 .
7. Cocklin, Robert F. "Artillery in Korea." Combat Forces Journal, August 1951, pp. 22-27.
8. Coffin, Robert E. "Attach or Support." Military Review, March 1952, pp. 13-18.
9. Crevecoeur, P. "The Tampella 155mm Gun-howitzer." International Defense Review, April 1976, pp. 662-663.
10. Cucino, Andrea. "The Integrated Maneuver and the Artillery's Test of Efficiency." Military Review , September 1951, pp. 102-104.
11. Evans, F.R. "Artillery in the Defense of a Wide Front." Military Review, August 1952, pp. 77-79.
12. Ferrari, Gino. "The Artillery Attack." Military Review, May 1951, pp. 80-82.
13. Finger, George H. "Mini-RPVs." Field Artillery Journal, July-August 1975, pp. 7-8 & 16.
14. Gor'kov, A., and Panevin I. "On Behalf of the General Mission." Field Artillery Journal, July-August 1975, pp. 20- 26.
15. Harold, Lyman. "Command and Control- Demands of the Battlefield." Armor, March-April 1975, pp. 31-32.
16. Hercz, Arthur R. "On Target Acquisition Again." Field Artillery Journal, November-December 1975, pp. 35-41.
17. Hunt, William T. "Evolution and Revolution in Tanks." Armor September-October 1975, pp. 13-16

18. Huppert, Harry G. "Mechanized Artillery." Armor, July-August 1962, pp. 43-45.
19. Ivanov, V. "Combating Self-Propelled Artillery." Field Artillery Journal, January-February 1975, pp. 54-58.
20. James, Gerard G. "TACFIRE." Field Artillery Journal, July-August 1975, pp. 28-33.
21. Jennette, Alexander T. "Mass Fire in WWI." Field Artillery Journal, May-June 1975, pp. 40-45.
22. Kutchinski, H.P. "Infantry Mobility." Infantry, March-April 1964, pp. 44-48.
23. Lavoie, Leon F. "The Artillery Perimeter." Combat Forces Journal, October 1951, pp. 25-26.
24. Lewis, Vernon B. "Evolving Field Artillery Tactics and Techniques." Field Artillery Journal, January-February 1975, pp. 44-48.
25. Manaker, Arnold M. "Engineering Developments in Artillery Technology." Field Artillery Journal, January-February 1975, pp. 39-41.
26. McCaffree, Robert. "Speed Up Your Artillery." Marine Corps Gazette, July 1963, pp. 41-44.
27. McCarthy, John F. "ROAD Artillery." Infantry, May-June 1962, pp. 2-5.
28. McColl, Alexander M.S. "Artillery Shock." Military Review, February 1975, pp. 82-84.
29. McMeekin, T.D.H. "The Best of Both Worlds." Journal of the Royal Artillery, May 1963, pp. 18-26.
30. Morony, T.L. "Artillery Support in the Yom Kipur War." Journal of the Royal Artillery, March 1975.
31. Ogorkiewicz, Richard M. "Self Propelled Guns." Armor, November-December 1951, pp. 6-11.
32. Ossorio, Peter M. "1975-80 The Division Artillery from Aachen to Zwolle." Field Artillery Journal, November-December 1975, pp. 7-13.
33. _____, "Counterfire!" Field Artillery Journal, part 1, November-December 1975, pp. 14-21, Part 2, January-February 1976, pp. 32-38.
34. Ott, David E. and Rhea, Donald M. "Counterfire." Army, July 1976, pp. 22-26.

35. Ragano, Frank P. "Smart Projectiles for Sharpshooting Artillery." National Defense, September-October 1975, pp. 120-123.

36. "Raise the Offensive Tempos." Military Review, February 1975, pp. 51-55.

37. Rhea, Donald M. "Target Acquisition Today...Tomorrow." Field Artillery Journal, March-April 1975, pp. 7-11.

38. Robinson, Leonard G., Jr. "Artillery - Arbiter of the Battlefield." Military Review, October 1952, pp. 3-10.

39. Rose, Kenneth H. Robotics: "It's Time to Get Off the Drawing Boards into the Field." Army, Vol. 40, February 1990, pp. 28-32.

40. Rudakov, V. "Destruction of Artillery Batteries." Soviet Military Review, October 1976, pp. 22-23.

41. Ryan, Michael W. "T-62 Briefing." Armor, November-December 1975, pp. 44-45.

42. Starry, Donn A. "Tank design: Our and Theirs." Armor, Part I, September-October 1975, pp. 5-9., Part II, November-December 1975, pp. 5-7,, Part III, January-February 1976, pp. 4-11, Part IV, March-April 1976, pp. 6-10.

43. Smith, Selwyn D. "The Infantry Division in the Defense." Military Review, November 1949, pp. 46-55.

44. Stevens, Ronald B. "FA Supports Division Covering Force." Field Artillery Journal, November-December 1975, pp. 43-45.

45. Tamminen, David L. "How to Defend Outnumbered and Win." Armor, November-December 1975, pp. 39-44.

46. Tee, T.O. "Modernize the Artillery." Combat Forces Journal, November 1951, pp. 31-33.

47. Tetu, Robert G., Jr. "Fire Support Symposium." Field Artillery Journal, September-October 1975, pp. 52-56.

48. Trudeau, Arthur G. "Extending Artillery Range." National Defense, November-December 1975, pp. 215-217.

49. Welch, Thomas J. "A Case for Land Navigation Systems." Field Artillery Journal, September-October 1975, pp. 7-10.

50. Williams, Charles L. "The Smart Round." Field Artillery Journal, March-April 1975, pp. 29-32.

51. Wrenn, R.L. "Hybrid Artillery." Field Artillery Journal, May-June 1975, pp. 7-11.

STANDARD REFERENCE WORKS

1. Jane's Armour and Artillery 1983-84. New York and London: Jane's Publishing Company Limited., 1984.
2. Jane's Infantry Weapons 1986-87. New and London: Jane's Publishing Company Limited., 1987.
3. Jane's Weapon Systems 1986-87. New York and London: Jane's Publishing Company Limited., 1987.

NEWSPAPER

1. "New ROAD Division Will Get 18% More Artillery Firepower." Army, Navy, Air Force Journal, 2 March 1963.
2. "Fire Support." NTC Lessons Learned, 1 September 1986, p. 7.

STUDENT RESEARCH PAPERS

1. Blakely, Larry A. Better Direct Support Artillery -- An Increasing Requirement, Student Essay. Carlisle Barracks: U.S. Army War College, Military History Library Archives, 1966.
2. Shaw, C. Raymond, Jr., The Field Artillery Dilemma: NTC Lessons Learned to Believe or Not to Believe?, Student Essay. Carlisle Barracks: U.S. Army War College, 23 April 1987.

Military Publications

1. Romjue, John L. A History of Army 86 (Vols I and II). Ft Monroe: U.S. Army Training and Doctrine Command, 1982.
2. Ott, David E. Vietnam Studies, Field Artillery 1954-1973. Washington : Department of the Army, 1975.
3. U.S. Department of the Army, Field Manual 6-20: Fire Support in the Airland Battle. Washington: 17 May 1988.
4. U.S. Department of the Army, Field Manual 6-20-2: Division Artillery, Field Artillery Brigade and Field Artillery Section (Corps). Washington: 30 September 1983.
5. U.S. Department of the Army, Field Manual 6-20-2J: Division Artillery, Field Artillery Brigade, and Corps Artillery Headquarters. Washington: 10 September 1984.
6. U.S. Department of the Army, Field Manual 6-20-30: Fire Support for Corps and Division Operations. Washington : 18 October 1989.
7. U.S. Department of the Army, Field Manual 100-5: Operations. Washington: 5 May 1986.
8. U.S. Department of the Army, Field Manual 100-16: Support Operations: Echelons Above Corps. Washington: 16 April 1985.

9. U.S. Department of the Army, Reference Book 100-6:
Selected Readings for Brigade and Battalion Operations. Ft
Leavenworth: September 1976.

10. U.S. Department of Defense, Joint Chiefs of Staff
Publication 1: Dictionary of Military and Associated Terms.
Washington: 1 June 1987.